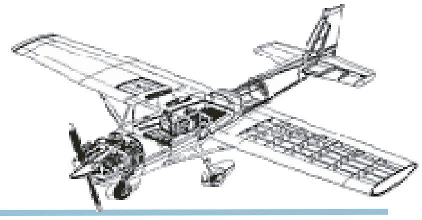
October 15, 2014
Volume 14, Issue 10

Treasure Valley EAA Chapter 837

EAAChapter837.org



Next Meeting...
Wed October 15, 7:30pm

Inside This Issue

Choosing An Airplane to Build?

By Jan Zumwalt
EAA #66327

In this article we will discuss the two primary approaches to building your own aircraft—(1) creating your own design, or (2) building from a reputable kit manufacturer.

Many believe there is no greater satisfaction than taking to the skies in a plane that you've designed and built yourself? You've got a long climb ahead of you, but some inexpensive tools and a very supportive community (such as the EAA) of like-minded pilots & mechanics will help you on your way.

1. BUILD VIRTUALLY FIRST

To test how well your ideas will work in practice, buy a copy of a good computer design program such as X-Plane. It lets you design a plane and then fly it over realistic landscapes. Homebuilt designer David Rose uses the program in conjunction with the CAD program AirplanePDQ (combined cost: $198). "With those two programs," he says, "I can do everything a $30,000 design suite can do."

2. DESIGN THE STRUCTURE

To configure actual parts and solicit advice on how to put them together, refer to some qualified people that already

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The World's Strangest Airplanes #10 - NASA M2-F1

The first flight tests of the M2-F1 were at Rogers Dry Lake...

The NASA M2-F1 was a lightweight, unpowered prototype aircraft, developed to flight test the wingless lifting body concept. It looked like a "flying bathtub," and was designated the M2-F1, the "M" referring to "manned" and "F" referring to "flight" version. In 1962, NASA Dryden management approved a program to build a lightweight, unpowered lifting body prototype. It featured a plywood shell placed over a tubular steel frame crafted at Dryden. Construction was completed in 1963

The lifting-body concept originated in the mid-1950s at the National Advisory Committee for Aeronautics' Ames Aeronautical Laboratory, Mountain View, California. By February 1962, a series of possible shapes had been developed, and R. Dale Reed was working to gain support for a research vehicle.

The construction of the M2-F1 was a joint effort by Dryden and a local glider manufacturer, the Briegleb Glider Company. The budget was US$30,000. NASA craftsmen and engineers built the tubular steel interior frame. Its mahogany plywood shell was handmade by Gus Briegleb and company. Ernie Lowder, a NASA craftsman who had worked on Howard Hughes' H-4 Hercules (or Spruce Goose), was assigned to help Briegleb.

Final assembly of the remaining components (including aluminum tail surfaces, push rod controls, and landing gear from a Cessna 150, which was later replaced by Cessna 180 landing gear) was done at the NASA facility.

The wingless, lifting body aircraft design was initially conceived as a means of landing a spacecraft horizontally after atmospheric reentry. The absence of wings would make the extreme heat of re-entry less damaging to the vehicle. Rather than using a ballistic reentry trajectory like a Command Module, very limited in manoeuvering range, a lifting body vehicle had a landing footprint the size of California.

A Letter From The President

By Jan Zumwalt
EAA #66327

MEETING HIGHLIGHTS

This past September we met on another beautiful evening. The meeting was a little late because we had 20 pilots observing the weather and making all kinds of predictions about the 3-5mph wind and what it may do in the next 5nin. Anyway, the wind finally did whatever it was going to do… which was to calm itself and remove any opportunity for decision.

late getting started because the members were enjoying each others company and the soft evening breeze was cooler than normal for this desert country.

Gary Webster had mended from his brief hospitable stay and everyone enjoyed his company.

The meeting reviewed options we have for hanger space and an update on the Ontario Golf course closure and Payette Airport Commission meeting.

FALL BBQ

We had the fall BBQ at Rod Cowgill's Ontario hanger. He asked for help hanging wings on a 2/3 scale Jenny he had recently bought.

There was beautiful weather for the BBQ and The Caldwell Top Fun Flyers turned out in force. Everyone had a good time.

TAKE TIME TO STUDY THE PROBLEM

There is no finer trouble shooters with the very best resources, than the talented folks we live with in the United States. With all the resources and brain power we sometimes rush to a solution without really understanding WHAT THE PROBLEM OR QUESTION REALLY WAS!

My father was the supervisor for construction of worker housing during the Grand Coulee Dam project. He had been sent a couple low educated workers. He showed each of them how to install electrical outlet boxes. They were carefully shown how to take a tape measure, read it and make a precise mark—then how to hold the box with one hand fasten with the other.

After a couple hours he came back to check on them. He figured that they might have done 3-4 homes. He looked in home #3—no one was there but the boxes where done.

As he walked down the row of homes he finally found them in home 11 or 12. They where just banging away 4 times faster than previous crews.

While he had expected them to work independently with a tape measure, they had cut a single piece of wood at the right length. One worker held the box in place with the wood support and the other banged the two nails that held it. These guys were mounting boxes as fast as they could walk thorough the house.

Technology is not always the answer - *take time to understand the problem!*

Always take time to fully understand a problem!

Choosing An Airplane to Build — continued

(Continued from page 1)

have some experience; like EAA pilots and mechanics at your local airport.

Plan on spending 4 times as much time researching as building. Some good books to read are Martin Hollmann's book *"Modern Aircraft Design"*. Hollmann also offers design classes at fly-ins, and structural consulting for intrepid airplane homebuilders. (aircraftdesigns.com).

Another good book is *"The Science of Flight"* by W.N. Hubin. This book explains why planes can and do what they do.

It covers the science behind an aircraft's flight from take-off to touchdown.

My personally favorite is *"A Practical Guide to Airplane Performance Design"* by Donald Crawford.

3. GET SUPPORT

The Experimental Aircraft Association, an organization of aviation enthusiasts, has branches all over the world. Local members can offer encouragement, advise you on technical issues and even help do the work. "A lot of people are willing to volunteer their time just to be involved in a project," Rose says.

4. GET TO WORK

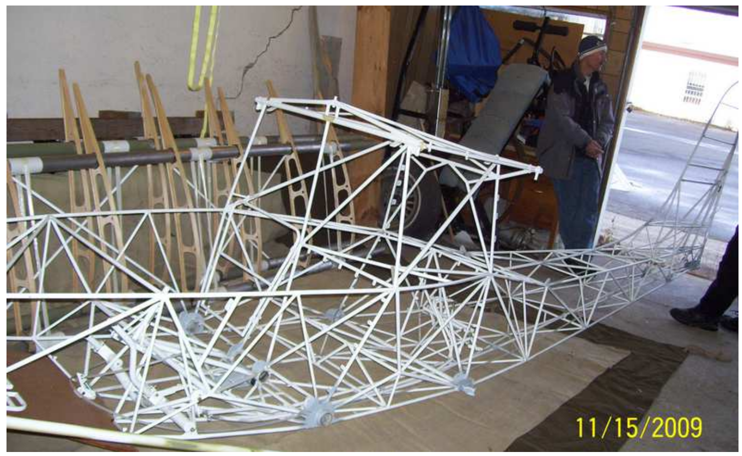
People who build planes of their own design tend to be retired folks with a lot of energy. "It's going to take at least two years of full-time work, including weekends,"

PLAN ON SPENDING 4 TIMES AS MUCH TIME RESEARCHING AS BUILDING.

Hollmann says. "And that's if you do everything right."

PLANES TO ORDER: SOME ASSEMBLY REQUIRED

Not totally committed to building an airplane from scratch? Consider buying a kit plane instead. Many manufacturers produce partially assembled airframes. Some companies even allow you to come to their factory and assemble the kit with the help of employees, potentially cutting the build time from months to weeks.



1. SHOP AROUND

Before you jump in, make sure the plane you're going to build is the right one for you. Read up on the various available models. The more successful designs have active online forums where builders can share their expertise. "Don't just base your decision on what a plane looks like," says Andy Chiavetta, a crew chief for Reno air-races pilot Darryl Greenamyer. "Talk to people who've flown them."

2. DABBLE

There are three main construction materials used in homebuilt planes: wood, metal and composite. Each has its own advantages and requires different aptitudes. Try them out to determine which suits you best. Every year the massive EAA AirVenture convention in Oshkosh, Wisc., holds hands-on workshops where would-be homebuilders can try different techniques.

3. START SMALL

Manufacturers such as Van's Aircraft sell partial kits. Buy the tail, and if building it is too hard or unsatisfying, you can rethink your options without wasting months of work and thousands of dollars.

4. BE REALISTIC

Even if you're involved in a builder-assist program, constructing a functioning aircraft requires a serious time commitment. "There are an awful lot of kit planes out there that get started and are never finished," Chiavetta says.

AREY OU READY?

1. Available Time to Complete a Project. Consider the years

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Choosing An Airplane to Build — continued

(Continued from page 4)

you have to complete the project vs. the average time it takes to assemble and complete the aircraft. As an average, most of us can dedicate 300 to 400 hours a year on a project.

2. Skills Available. What are your skills? Are you looking to add new skills or do you just want to get an aircraft flying as quickly as possible? Wood, metal, tubing, welding, composites or a combination of all or some.

3. Plans Type. Are you looking for a scratch built aircraft or a kit built aircraft. Scratch built aircraft are generally less expensive but require more time. Kit built aircraft generally take less time but require more money.

4. Work Space Available. Basement, garage, living room. You get the picture. What kind of processes will you be doing. Will the construction have a by-product of smell, dust, and dirt? Is the construction method compatible with the family environment?

5. Health Consideration. Will the construction process affect you or your family's heath? Epoxy fumes, wood dust, oxy-acetylene storage, noise from riveting, sloshing compounds? All have the possibility to adversely affect the health of you or your family.

6. Financial Condition. Believe it or not, this is really the last

Is the company easy to reach and are replacement parts available?

consideration. Once you have considered all else you will eventually find a way to pay for the project of choice. With most VW powered aircraft priced between $10,000 and $20,000. The eventual cost will not be the up front issue you may first think it to be.

EVALUATION OF AIRCRAFT

To help you evaluate aircraft to build consider the following:

1. Is the company or individual promoting the aircraft involved full time or part time?

2. Can you reach the company during the day or at night only?

3. How long has the company or individual been in business promoting the aircraft?

4. What is the reputation of the company or individuals selling the aircraft?

5. How many plans for your aircraft of choice have been sold? Over what period of time?

6. Has the ownership of the plans rights ever changed hands? If so, under what circumstances?

7. Builder support. Is there any? Is there a newsletter? How about an annual type aircraft get together.

8. Replacement parts. Are they available? This is perhaps the most important consideration, especially if you are considering a kit-built aircraft. What happens to replacement parts, if the company goes out of business?

What Is An Engine Overhaul?

By Jan Zumwalt
EAA #66327

So, you are thinking of buying an airplane and the owner assures you that it had an "Engine Overhaul" a certain number of hours ago—and everything is fine. What really are you being told was done?

The problem is that there have been quite a few law suits over what an "overhaul" is. The problem has became so great that the FAA has issued an Advisory circular (ac-43-11 chg1) dated 3/29/07 to define engine overhaul terminology and is now the basis for many lawsuits.

Lets look at a few important points in this AC.

PURPOSE

The advisory circular (AC) discusses engine *overhaul terminology and standards [to be] used in the aviation industry*. This AC will:

a. Inform owners or operators of the variety of terms used to describe types of reciprocating engine overhaul;

b. Clarify the standards used by the industry during reciprocating engine overhaul; and

c. Review Title 14 of the Code of Federal Regulations (14 CFR) regarding engine records and standards.

The average aircraft owner usually selects an overhaul facility based on the cost quoted by the engine overhauler. Engine overhauls are accomplished to a variety of standards. Many different facilities perform engine overhauls, ranging from engine manufacturers, large repair stations, or individual powerplant mechanics. The selection of an overhaul facility can and does, in most cases, determine the standards used during overhaul. *Section 43.13(a) requires the person performing the overhaul to use methods, techniques, and practices that are acceptable to the Administrator.* In most cases, the standards outlined in the engine manufacturer's overhaul manual are standards acceptable to the Administrator.

WATCH OUT — USED PARTS CAN BE INSTALLED AND CALLED "NEW" IF THEY MEET "NEW" SPECIFICATIONS. THIS REGULATION IS THE CAUSE FOR MANY LAWSUITS!

MEASUREMENTS

Fits and Limits. Engine overhaul manuals outline the two kinds of dimensional limits observed during engine overhaul as a "Table of Limits" or a "Table of Dimensional Limits." These tables list the parts of the engine that are subject to wear, and contain minimum and maximum figures for the dimensions of those parts and the clearances between mating surfaces. The lists specify two limits as follows:

Manufacturer's Minimum and Maximum. Some manufacturers use the terms *"new parts"* or *"new limits"* when referring to these dimensional limits.

These are the dimensions and standards that all new parts meet as required by 14 CFR for the issuance of a type certificate (TC). It is important to note that new dimensions do not mean new parts are installed in an engine when a manufacturer, or the manufacturer's authorized representative, presents zero time re-

Engine Overhaul — continued

cords in accordance with § 91.421. *It does mean that used parts in the engine were inspected and met the manufacturer's new specifications.*

Service Limits. Service limits are dimensions representing limits that must not be exceeded and are dimension limits for permissible wear.

The comparative measurement of parts will determine their serviceability; however, it is not always easy to determine which part has the most wear. The manufacturer's new dimensions or limits are a guide for determining the amount of wear that has occurred during service. In an engine overhaul certain parts are replaced regardless of condition. If an engine is overhauled to "serviceable" limits, the parts must conform to the fits and limits specifications as listed in the manufacturer's overhaul manuals and Service Bulletins (SB).

If a major overhaul is performed to serviceable limits or an engine is top overhauled, the *total time on the engine continues* in the engine records.

OVERHAUL

In the general aviation industry, the term engine overhaul has two identifications that make a distinction between the degrees of work on an engine:

(1) Major Overhaul. A major overhaul consists of the complete disassembly of an engine. The overhaul facility inspects the engine, repairs it as necessary, reassembles, tests, and approves it for return to service within the fits and limits specified by the manufacturer's overhaul data. This could be to new fits and limits or serviceable limits. The engine owner should clearly understand what fits and limits should be used when the engine is presented for overhaul. The owner should also be aware of any replaced parts, regardless of condition, as a result of a manufacturer's overhaul data, SB, or an Airworthiness Directive (AD).

(2) Top Overhaul. Top overhaul consists of repair to parts outside of the crankcase, and can be accomplished without completely disassembling the entire engine. It can include the removal of cylinders, inspection and repair to cylinders, inspection and repair to cylinder walls, pistons, valve-operation mechanisms, valve guides, valve seats, and the replacement of piston and piston rings. All manufacturers do not recommend a top overhaul. Some manufacturers indicate that a powerplant requiring work to this extent should receive a complete overhaul.

REBUILT

(1) A rebuilt engine as defined in § 91.421, "is a used engine that has been completely disassembled, inspected, repaired as necessary, reassembled, tested, and approved in the same manner and to the same tolerances and limits as a new engine with either new or used parts. However, all parts used must conform to the production drawing tolerances and limits for new parts or be of approved oversized or undersized dimensions for a new engine."

(2) The definition of the term "rebuilt" in § 91.421 allows the owner or operator to use a *new maintenance record without previous operating history* for an aircraft engine rebuilt by the manufacturer or an agency *approved by the manufacturer*.

REMANUFACTURE

(1)The general term remanufacture has no specific meaning in the regulations. A new engine is a product that is manufactured from raw materials. These raw materials are made into parts and accessories that conform to specifications for issuance of an engine's TC. The term "remanufactured" infers that it would be necessary to return the part to its basic raw material and manufacture it again.

"Remanufactured" as used by most engine manufacturers and overhaul facilities, means that an engine has been overhauled to *meet the standards required to grant the engine zero time* in accordance with § 91.421.

2) Not all engine overhaul facilities which advertise "Remanufactured Engines" overhaul engines to new dimensions. Some of these facilities do overhaul to new dimensions, but may not be authorized to zero time the engine records. As outlined in § 91.421, *only the manufacturer or an agency approved by the manufacturer can grant zero time to an engine.*

Be informed before you buy!

Polycarbonate vs Acrylic

By Jan Zumwalt
EAA #66327

Sheet grade polycarbonate and acrylic (Polymethyl methacrylate) sheet are glass-like plastics, hard, clear, and are used in place of glass.

Each of the two have benefits and drawbacks. Acrylic is shinier and polycarb is stronger. Acrylic is less expensive but easier to crack. Polycarb is more impact resistant but easier to scratch.

They are both stronger and lighter than untempered glass; acrylic is 4 to 8x stronger than glass, while polycarb is about 200x stronger.

A video produced by the motorcycle windshield company National Cycle illustrates some of these differences. After the examples of bullets, basball bats, hammers, etc., you'll get the idea that polycarb bends and scratches but doesn't break; and acrylic stays stiff and shiny but cracks and shatters under impact.

ACRYLIC (LUCITE)

- More likely to chip, less impact resistance then Polycarbonate but still 10-24 times more resistant than glass).
- Less likely to scratch.
- Easier to find at hardware stores.
- Does NOT yellow after time.
- Better clarity and can be restored to optical clarity.

POLYCARBONATE (LEXAN)

- Impact/chip resistance is about 30 times more than glass.
- Scratches easier than Acrylic.
- roughly 2 to 3 times more expensive.
- Bends and forms easier.
- Yellows over time due to ultraviolet rays.
- Easier to work with (cut, less likely to break)

LIGHT & CLARITY

Acrylic has better clarity than glass, with a light transmittance of 92 percent and refractive index of 1.49. Polycarbonate has a light transmittance of 88 percent and refractive index of 1.585.

Acrylic can be polished to restore its clarity, while polycarbonate cannot.

WORKING WITH THEM

Small quantities (less than a 4 by 8) in gauges over 1/8th inch are difficult to to find in the uv/scratch resistant grades. Colors are limited. Only two standards (gray and bronze). It is hard to find anything thicker than 1/4 in UV/scratch resistant!

FASTENING

NEVER ever bolt or screw either plastic with tight fiting fasteners. Both plastics have very large changes in dimension with small heat changes. Holes should be drilled at least twice as large as the fastener and some type of flexibale material such as groments used to protect the plastic from direct contact with the fastener.

The coefficient of thermal expansion for Acrylic and Polycarbonate is about .000039 per inch per degree F. A 4ft long piece of plastic will expand and contract up to 1/4" from the coldest winter day to the hottest day in summer.

Silicone or putty may be used as a "flexible" attachment. Lightly tightened clips or other hardware may also be used at the edges.

CUTTING

Both acrylic and polycarbonate can be cut with conventional tools such as saws or routers, though acrylic cuts easier than polycarbonate. Polycarbonate fights the initial push of a saw or router at the start of a cut.

DRILLING

Acrylic will crack if it is drilled near an edge or with a drill bit not designed for plastic. Special bits are made to reduce the chances of chip-

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Polycarbonate vs Acrylic — continued

ping.

Polycarbonate typically does not crack when being drilled even if drilled close to the edge with a standard drill bit.

Both plastics can be penetrated with a hot knife or soldering iron.

POLISHING

The edges of acrylic can be polished smooth if necessary; polycarbonate cannot be polished.

HEAT BENDING

Heat bending works better with acrylic than polycarbonate. Polycarbonate can be cold formed or bent without heating.

GLUING

Gluing with cements designed for acrylic and polycarbonate, acrylic gives a cleaner glue joint than polycarbonate.

CLEANING

Both acrylic and polycarbonate are easy to clean. Both can scratch, so wool rags and paper towels, which are made from abrasive binding agents, should be avoided. The best choice for cleaning is a microfibre or 100% cotton cloths.

Acrylic has a low chemical resistance and needs more specific cleaners. When cleaning acrylic, it is best to use only mild soap and water or a plastic cleaner.

Polycarbonate has a higher chemical resistance than acrylic; it can be cleaned by harsher cleaners containing chemicals such as ammonia. Neither plastic should be cleaned with solvents.

TRADE NAMES

Acrylic: Plexiglas, Lucite, Perspex, Policril, Gavrieli, Vitroflex, Limacryl, R-Cast, Per-Clax, Plazcryl, Acrylex, Acrylite, Acrylplast, Altuglas, Polycast, Oroglass, Optix

Polycarbonate: Lexan, Makrolon

DURABILITY

Polycarbonate is impact resistant. When its new it is almost impossible to break.

WEATHERING

Both plastics are hydroscopic (will absorb a small amount of moisture on side facing moisture (warps). But rarely presents a problem. This can be used to advantage - it can be tinted using ordinary water based cloth dyes.

Acrylic has excellent resistance to weathering. UV light does very little damage to Acrylic over time and so Acrylic is often a good choice for outdoor applications. The rear tail-lights of a car are often made from Acrylic because the colors are very stable and resistant to UV and the potential damage from stone chips is low at the rear of the car. Acrylic has an almost unlimited resistance to weathering.

Polycarbonate weathers when exposed to UV light. This weathering often takes the form of yellowing and micro-cracking of the material. It is possible to reduce the effects of weathering by either adding a cap layer of UV absorbers or a coating loaded with UV absorbers. These solutions do however add to the cost of the Polycarbonate sheet and will only protect the product for 10 to 15 years.

There are some advanced solutions to protect Polycarbonate for 25+ years from High-Line Polycarbonate but these are very expensive and are often cost prohibitive for most applications.

HEAT STABILITY

Both acrylic and polycarbonate expand and contract with temperature, there are long-term or permanent shrinkage.

Acrylic can be used at temperatures ranging from -30 degrees Fahrenheit to 190 degrees Fahrenheit.

Acrylic has a heat distortion (soft) temperature under a load of 260 psi of 200 degrees

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Polycarbonate vs Acrylic — continued

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POLYCARBONATE CAN NOT BE SANDED OR RE-POLISHED. ATTEMPTING TO RUB IT CAUSES IT TO FOG AND SMALL HAIR LIKE FUSS WILL STICK OUT FROM THE SURFACE.

F. It melts at 320 °F (160 °C) and fires are considered self-extinguishing.

Acrylic is flammable at certain temperatures so heating by open flame is not recommended, and other methods of heating may cause it to adhere to the heating device itself.

Acrylic does not 'outgas' or cause toxicologically harm. Though, when burned it creates very thick noxious smoke. OSHA classifies it as non-hazardous.

Polycarbonate can handle temperatures up to 240 degrees Fahrenheit and has a heat distortion temperature of 264 degrees F. Polycarbonate is also highly resistant to chemicals such as gasoline and acids.

Polycarbonate has low flammability, while acrylic will burn slowly and is not recommended in areas where flames may be present.

Polycarbonate is much more resistant to temperature than Acrylic. This means that if the application involves a higher temperature environment where the structural integrity of the material is required, Polycarbonate may be a better choice. The Heat Stability is also important in vapor deposition of coatings such as Indium Tin Oxide. It is possible to apply more conductive surfaces onto Polycarbonate than Acrylic.

THIS IMAGE SHOWS THE DIFFERENCE BETWEEN WHAT A PILOT SEES IN A TYPICAL UNMAINTAINED AIRCRAFT VS. A MAINTAINED ONE. ALL IT TOOK TO RESTORE ONE HALF OF THIS COCKPIT WAS THE MICRO-MESH™ LIGHT DAMAGE REMOVAL KIT. WHICH WINDOW WOULD YOU RATHER SEE THROUGH?

REPAIR

Polycarbonate can not be sanded or re-polished. Attempting to rub it causes it to fog and small hair like fuss will stick out from the surface. Scratches are pretty much unrepairable.

Acrylic scratches are very easy to repair. Very Minor scratches may be polished away with products such as Novus, Novus3, or Mirror Glaze, and toothpaste.

Very deep Acrylic scratches can be scraped (gouged) with a metal tool or curved edge of a knife until the scratch's bottom is reached, then use the progressive sanding & polishing technique described next.

Removing acrylic scratches (ones that you can see or feel by passing a fingernail over them) can be accomplished by using a series of course to fine wet sandpaper. Micro-Mesh is one very good commercially available kit.

Start by wetting & sanding with #400 until the entire scratch is gone and a dull foggy luster is left. Then sand with about 20 to 30 strokes of each size (it does not do any good to rub with more than 30 strokes because the plastic slurry scratches the surface too).

Then go on to the next size… # 1000, #1500, #2000, and finally #2500.

The surface should be wiped clean after each sandpaper grade or the courser grit will continue to scratch. It may necessary to wet the area several times during each size because the water dries.

Even quite deep scratches can be removed in about 10min.

Don't Yank That Jug

By Mike Busch
The Savvy Aviator

I really enjoy helping fellow aircraft owners, but I often get frustrated by some of the poor advice they get from their mechanics. Take this one, for example:

"Mike, I'm having a problem and need some advice. My airplane is in for annual and for the second year in a row my TCM IO-520 engine has some low compressions. The compression test was done hot (or at least that's what I'm told)."

"The IA is going to do another compression check today, cold, but I don't think that is going to change anything. He said the leaks seem to be from the exhaust valves. I looked at the exhaust valve of the lowest-compression cylinder through a borescope, and the valve was red in color."

IN FACT, THE COOLER THE VALVE IS OPERATING, THE THICKER THE DEPOSITS AND THE MORE INTENSELY RED THE VALVE APPEARS. IT'S ACTUALLY THE ABSENCE OF RED DEPOSITS THAT TELLS US THE VALVE IS HEAT-DAMAGED AND LEAKING.

"The IA said that is because it's run too hot, and suggested that the culprit was my use of lean-of-peak mixture settings in cruise. "

"I fly about 100 hours a year. Most of my trips are about four hours long. I usually cruise between 8000 and 9000 feet. My power settings, at 8,000 feet, are about 22 inches at about 2400 RPM. I lean to peak on my JPI 700, then go about 15 degrees F lean of peak. My hottest CHT is never above 380 degrees F. What am I doing wrong when flying this airplane?"

FLAWED ADVICE

I told this owner that he's getting flawed advice from his IA.

For one thing, the owner isn't doing anything wrong. 15 degrees F lean of peak and CHTs below 380 degrees F are exactly where this normally-aspirated engine should be operated at 8000 to 9000 feet.

He's doing a great job of powerplant management. For another, an exhaust valve is supposed to be red! The red color is from exhaust deposits on the face of the valve, and such deposits are perfectly normal.

In fact, the cooler the valve is operating, the thicker the deposits and the more intensely red the valve appears. It's actually the absence of red deposits that tells us the valve is heat-damaged and leaking.

The key to whether or not the valve is burned is the appearance of those red deposits. On a normal valve, when viewed with the borescope (see photo at right), the red deposits have a relatively symmetricalappearance, with the redness most pronounced in the center of the valve face and less pronounced toward the edges of the valve face. That's because the valve face runs coolest at the center (where it's thickest and its heat is well-sinked by the

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Don't Yank That Jug — continued

(Continued from page 11)

Normal looking valve

Burnt valve

valve stem), and hottest at the edges (where it's thinnest and not so well heat-sinked).

The hotter the valve, the less red deposits there are; the cooler the valve, the more red deposits there are. In other words, red means cool and the absence of red means hot! (I know this sounds counterintuitive, because we're used to thinking of red and hot as being associated, but in this case it's non-red and hot that are associated!)

If the valve is leaking, there will be one (or sometimes two) hot-spots around the circumference of the valve face where almost all the red deposits are gone and you see gray metal. The red exhaust deposits will have an asymmetrical appearance (see photo at right), with the hot-spots identified as being where the valve is least red.

DON'T YANK THAT JUG!

If the borescope inspection shows a valve with a normal-looking, symmetrical pattern of red deposits and no obvious hot spots, I would not authorize the mechanic to remove the cylinder. I would go fly it for a few hours and then repeat the compression test. (Preferably have another mechanic do the test.) To be on the safe side, I would continue to inspect the valve with a borescope every 50 hours (at each oil change). Since the aircraft has a digital engine monitor, I would also suggest keeping a close eye on the EGTs. Always place your engine monitor in its "normalize mode" when in cruise flight.

This will level all the EGT bars at mid-scale and increase the sensitivity, so that small EGT variations become very obvious. If the exhaust valve is leaking in flight, you will see it on the engine monitor (provided it is in normalize mode).

The classic signature of a leaking exhaust valve is a slow EGT oscillation of 30 degrees F to 60 degrees F that occurs about once or twice a minute (see graphic at right). Any time you see something like this, immediately borescope the cylinder and check the valve.

In my experience, a burned valve becomes detectable under the borescope (via asymmetrical exhaust-deposits revealing a well-defined hot-spot or two) at least 100 hours before the valve actually reaches the point of failure. The engine monitor will also detect the problem, but with somewhat less lead time -- perhaps 10 to 25 hours before failure.

I believe that regular borescope inspections should be the first line of defense in detecting incipient exhaust-valve problems, with the engine monitor used as a backup. The use of regular boroscopy in piston-aircraft engine maintenance is relatively new, and many mechanics don't really understand what to look for. They almost certainly received no training on this in A&P school.

Before authorizing a mechanic to pull a cylinder off your engine, you would be wise to do what this owner did - seek a second opinion.

Compression Limits

By Mike Busch

An owner emailed me a follow-up question:

"Is there any regulation as to the minimum compression on a cylinder in order to pass an annual? My IA tells me the engine should not have passed the last annual because of low compressions."

Excellent question!

Yes, there sure is. The applicable regulation -- 14 CFR Part 43 Appendix D (Scope and Detail of Annual and 100-Hour Inspections) -- states that an IA is required to perform a compression check at each annual and 100-hour inspection.

It goes on to say that if "weak compression" is found, the IA must perform an internal cylinder inspection to ascertain the reason for the weak compression. The FARs do not define the term "weak compression."

FAA Advisory Circular AC43.13-1B (Acceptable Methods, Techniques and Practices -- Aircraft Inspection and Repair) suggests that compression readings below 60/80 are considered "weak," but this default FAA guidance is superseded by any specific guidance offered by the engine manufacturer.

Because both Lycoming and Continental (previously TCM) do offer specific guidance, AC43.13-1B is moot. Lycoming's guidance is that the inspecting mechanic should "consider" removing the cylinder if its compression is below 60/80, or if there is more than a 10-point spread between the highest and lowest cylinder.

Lycoming also encourages (but does not require) mechanics to use borescope inspections to help assess cylinder condition. Lycoming's use of the word "consider" appears to give the IA some wiggle room, but most IAs will take the position that a Lycoming cylinder with compression below 60/80 has to come off.

Continental's guidance is very different and appears in Service Bulletin SB03-3, which in my opinion is the best guidance ever written on the subject of determining cylinder condition.

Every Continental owner should download a copy (by clicking on that link) and read it carefully. If you do that, you'll find that Continental says that the minimum acceptable compression reading is to be established using a "master-orifice tool" hooked up to the mechanic's compression test gauges.

For most compression test gauges we've checked, the master-orifice tool sets the no-go limit between 41/80 and 43/80. However, each gauge is supposed to be calibrated with the tool prior to each compression test. (Nowadays, many compression test gauges come with the master-orifice tool built right in, so calibration is done simply by flipping a valve.) SB03-3 goes on to say that even if a cylinder indicates a compression reading lower than the no-go limit, the IA is supposed to inspect the cylinder with a borescope to determine the cause of the problem.

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Compression Limits — continued

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If the borescope inspection fails to reveal a problem, then the cylinder should not be removed. Instead, the engine should be flown for at least 45 minutes (preferably a lot longer) and then the compression test repeated.

HAVE NO FEAR

Armed with my advice and a copy of Continental service bulletin SB03-3, the owner had a heart-to-heart conversation with his IA, and then reported back to me with the following:

"The IA just called and said that he has completed the annual, and agreed not to pull the cylinder. He said to fly the airplane for 25 hours and he will then recheck the compressions. I feel half afraid to fly the thing."

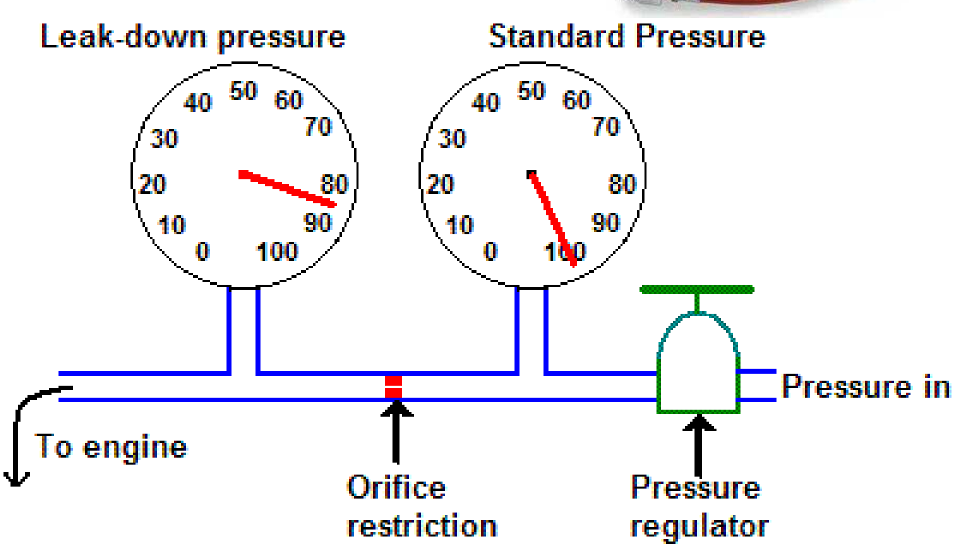
I advised the owner not to be scared to fly the airplane. Low compression never made anyone fall out of the sky. In fact, before issuing SB03-3, Continental actually ran some dynamometer tests in its test cell that showed an engine with all cylinders having 40/80 compression will make full-rated power.

An engine with such low compression will also blow lots of oil out the breather and onto the belly of the aircraft, and will make what's left of the oil in the crankcase filthy in short order, but there will be little or no perceptible difference in performance, and certainly no safety-of-flight issues. An in-flight failure of an exhaust valve is no laughing matter. But as long as the exhaust valve looks normal under the borescope, you can be confident that it's not in imminent danger of failing.

Regular borescope inspections, backed up by a digital engine monitor, will reliably detect exhaust-valve problems before they pose a safety hazard. I'm not suggesting that compression readings in the 40s are fine, nor that they should be ignored. Such low compressions are often associated with excessive blow-by that contaminates the oil with combustion byproducts and turns it acidic and corrosive -- not exactly the ideal environment for your expensive crankshaft and camshaft to live in.

But such compressions will not cause any perceptible change in engine power or performance, and certainly won't make you fall out of the sky. So it's something to be concerned about, not something to be scared of. With such low compressions, it would certainly be prudent to re-check the compression and re-borescope the cylinder in 25 hours.

If the compression continues to deteriorate or the borescope reveals the obvious visual signature of a burned valve or worn barrel, then the jug probably does need to come off for repair or replacement. In the meantime, however, the owner should have no qualms about continuing to fly the aircraft.



Which Multimeter Should I buy?

Fluke Clamp Meter

By Jack Arcarde

Be it a small electronic connection or a large complicated circuit, every component ranging from a simple diode to a complex power amplifier needs to be tested for electrical properties. A multimeter is an mechanics primary tool for this and making sure you have the right meter at the right price might take some planning.

Multimeters are electronic devices that measure voltage, current and resistance. Although there are many different types of multimeters with different functions and benefits, your first consideration should be analog or digital.

ANALOG VERSUS DIGITAL

Analog multimeters, as you would suspect, use classic analog dials (shown right) for measuring voltage, current and resistance.

These are quite rare but there are certain problems they are be

st suited for. After the slightest change in DC voltage, the needle will twich while a digital won't show this.

On the other hand digital meters are much more accureat in measurements.

The world is dominated by digital multimeters (DMMs). They typically consist of an LCD display, and a knob to select various ranges.

Generally speaking, we recommend DMMs, but there are still hundreds of models to choose from, so you need to filter down your options and consider various factors when selecting the correct DMM for you. Here are some things to keep in mind:
Analog Dial

DIGITAL MULTIMETER LCD DISPLAY

DMMs are available in a wide range of prices staring from $5 to $1500. This depends on the brand and the included features. Higher priced meters usually have more features, greater accuracy, and more durable than lower priced models.

In general, I recommend looking at how frequently you will use the device and the features you need. If this is an occasional tool, a lower priced unit is probably fine. But, the more you plan to use the meter, the more you'll want a robust design and more expensive meter.

Display Counts: The resolution of a meter, or display counts, is the smallest part of the scale which can be shown and is scale dependent. It refers to how large of a number the meter can display or the total digits that are displayed. The higher the display count, the better. Compare multimeters with display counts of more than 1,000 here.

Measurements and Functionality: Basic multimeters have standard features such as measuring AC and DC current, voltages, resistance and capacitance. Other meters offer various tests (diode test, battery test, continuity test, transistor test) and special functions (auto range, analog bar graph, RS-232 PC interface, true RMS), which makes them more useful than a standard multimeter. Check out the device's user manual to review the functions offered and select your meter accordingly.

Safety: When dealing with high voltages, it's very important to know which meter you should use. Based on the amount of current flowing through the conductor, you may want to choose a device that's a cross between a multimeter and a clamp meter.

We Fly The AkroSport

The AkroSport

By Budd Davisson

AKRO: *The ability to viciously cavort; Those maneuvers directly preceding a violent wrenching of the abdomen mus-cles; Fun of a masochistic nature.*

SPORT: *A game in which the challenge can be readily met; A good guy, liked by all; A form of relaxation usually involving strenuous, s but not neces-sarily exhausting, exercise.*

Put them all together and they don't, as the song says, spell "mother." What they do spell is "Akrosport" and, if the definitions are taken literally, it is defined as a violently maneuverable good guy that gives one the ability to put your already eaten lunch in your vest pocket and presents a challenge most of us can master with little or no sweat. Is that the Akrosport? If not, it's darned close.

POBEREZNY AND EAA HQ TALKED TO EVERYBODY WHO IS WORTH TALKING TO WHEN DESIGNING THE AKROSPORT...

The Akrosport is the latest official biplane offering to come floating down from the EAA's Wisconsin think tank to amaze and delight us. It was the logical son of a logical progression that began in the 1950's when the EAA was formed and everybody went about whittling out designs. Come the early '60's and baby biplanes were all over the place like fleas on a Tijuana hotdog. However, they all had similar traits; they were so tiny that they approached and landed like cast iron hockey pucks . . . fast and hot. Many wingtips were scrunched. After maybe ten years of this, Paul Poberezny, the rag and

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AkroSport — continued

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tube guru of the EAA, decided there had to be a better way. Not only were these hot, but he couldn't fit in most of them. Out came his handy book of aeronautical rules of thumb, he called a few knowledgeable folks, and they whipped together a bipe for the masses, the EAA Biplane (in naming airplanes, imagery wasn't their strong point). So for the next few years the EAA bipe satisfied the need for an easy to fly, big enough for a beer belly bi-plane.

AKROSPORT—2

When the early 1970's, all was not roses in the Wisconsin hinter-lands. For one thing, aerobatics had been coming on strong and the EAA bipe was not known for hard driving, varicose vein acrobatics. The need was felt for a fully acrobatic version of the EAA bipe that would let a pilot feel like he's flying a Pitts without having his pucker factor go off the scale ev-ery time he sees the runway in front of him. The parameters were simple enough; the airplane would have to offer most of the acrobatic ease and ca-pability of the Pitts but have economical construction and easy handling charac-teristics that most pilots could hack. The Akrosport was born.

The story is, Poberezny and EAA HQ talked to everybody who is worth talking to when designing the Akrosport and it's a fact that Curtis Pitts had his say about what was done. The final re-sult is a straightforward appearing biplane significantly larger than a Pitts with Hershey bar wings and widely splayed landing gear.

But, that's all history. The Akrosport is now 4 years old and there are at least 14 flying with engines ranging from 100 to 200 hp. The basic plans cost $60 for an airplane utilizing an M6 airfoil, which is the same as the flat wing Pitts. For an additional $15 You can get the plans for the Super Akrosport wing, which is an almost symmetrical 23012 section that's much better suited to outside maneuvers.

Approximately 1000 sets of plans have been sold and, if the usual four or five to one ratio holds, about 250 are actually being built. If you believe the FAA's statistics that only one out of ten home builts started are finished, then eventually we'll see a minimum of 25 Akrosports flying. They will obviously top that number.

Interestingly enough, the effort to de-sign airplanes that they feel better fit the average market has placed Poberezny and the EAA hierarchy in a dicey po-sition. Some plans vendors are mad as hell because they feel the EAA has used the HQ facilities and membership money to go into competition with member designers who are selling plans.

AkroSport 1

General characteristics

- Crew: 1
- Capacity: 2
- Length: 18 ft 10.25 in (5.7468 m)
- Wingspan: 21 ft 8 in (6.60 m)
- Height: 6 ft 7.75 in (2.0257 m)
- Wing area: 152 sq ft (14.1 m2)
- Empty weight: 875 lb (397 kg)
- Gross weight: 1,520 lb (689 kg)
- Powerplant: 1 × Lycoming prop, 180 hp (130 kW)

Performance

- Maximum speed: 152 mph (245 km/h; 132 kn)
- Cruise speed: 123 mph (107 kn; 198 km/h)
- Stall speed: 53 mph (46 kn; 85 km/h)
- Range: 430 mi (374 nmi; 692 km)
- Service ceiling: 20,000 ft (6,096 m)

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AkroSport — continued

(Continued from page 17)

They are right. That's exactly what the EAA has done. However, there are others, myself included, who say that's what the EAA is for. If the inde-pendent designers haven't been filling all the marketing niches and there is a need for a better or different airplane, then Poberezny doesn't have much choice but to design what is needed.

Of course, there's also the argument about exactly how good the EAA de-signs are. For instance, in the case of the Akrosport, at least two problems manifested themselves in the first air-planes built. First, the cg could wind up right on the front of the enve-lope, depending how the aircraft was equipped.

Secondly, and more important, the size of the landing gear tubing originally called out and since changed wasn't sufficient to take the compressive loads of landing. There have been at least three known cases of landing gear Vees collapsing and the aircraft being substantially damaged.

From a purely personal point, when I examined the Akrosport carefully, I found it to be what you would expect for an airplane that was being built as fast as it was being designed, maybe faster. It's obviously heavier than it needs to be, because in all probability the structural analysis was of a rather basic nature, utilizing overlapping as-sumptions to make certain everything is kosher.

This isn't a bad way to go, but it does add weight and it some-times lets things slip by because there has been no finite analysis of every structural member. As it happens, this is the way almost everybody designs airplanes, homebuilts and otherwise, so the Poberezny design team is certainly not guilty of anything unusual. It does, however, give some folks ammunition for taking potshots at the EAA.

The design being what it is, aimed at the masses and sure to be built in large numbers, I wanted to fly the air-plane badly. I was curious as to how well the EAA had met their design goals. However, for at least three years, every time I got ready to fly the EAA's own Akrosport, something got screwed up in my schedule.

It wasn't until a plans built version was finished at my local aerodrome, beautiful Sussex In-ternational in New Jersey, that I finally had the opportunity to fly the airplane. Even then, it took a couple of years to get around to it.

N869M is the second plan built Akrosport to be finished. The fact that it was finished as fast as it was is the result of several unusual situations. Jim Inman, the owner, had gone to Osh-kosh with a wad of bills in his pocket determined to come home with an air-plane. He was tired of rattling around in his T34 and was hot for something else. He came home empty handed because there just wasn't anything avail-able that fit his needs.

What did fit his needs was the EAA's Akrosport he saw

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AkroSport — continued

(Continued from page 18)

being demonstrated and the Akrosport components display that WagAero had in the exhibit building. His solution? Have an Akrosport built! Enter Bill Shaft, local A & P and all around bolt bender; Bill did most of Inman's T34 maintenance and is the only guy we trust to work on our Pitts. He's good at what he does and almost never misses an Oshkosh. He's a torch and dope man who knows and digs flying machines of the "Wisconsin Weird" variety. What more can you ask for?

To compress the time frame of the project, Inman opted to purchase all the finished components he could from Wag Aero. This included a welded up fuselage and tail feathers, wood and spar kits, welded landing gear, and a few other bits and pieces. This doesn't do much for keeping costs down but it does wonders for the economy of Wisconsin.

AKROSPORT LEVEL

The lines are just naturally well proportioned, don't you think?

Even with all the components in house, having all the skill in the world, and working. four to six hours a day, it still took Shaft ten months to get the airplane into the air, something worth remembering if you're contem-plating a home-built project.

Anyway, it did fly and Jim spent an inordinate amount of time bombing around the countryside getting his rocks off by drawing obscene pictures in the sky with his smoke system. Then, after 168 hours, the glitch in the land-ing gear design caught up with him. During a landing the airplane was behaving entirely normally, then for no reason started to swerve to the right. Inman dropped the hammer again and took off wondering what the hell was going on. He tried it again with the same results then noticed he could see the right wheel pant above the lower wing and he knew he was in trouble.

The right gear leg had failed in com-pression, letting the wheel move up about a foot. Heaving a sigh of resig-nation, he set it down in the grass, rolled out on one gear leg and held the right wing up as long as possible. Even-tually the right wing tip touched and he sucked his head in like a turtle. The nose caught, and he would have wound up standing on his head in the dirt had the airplane not been caught and held off the ground as it went past vertical by a stand of small trees.

Three wing panels and the gear needed tons of patching to get it back in the air. Since then, he's had little or no trouble with the airplane.

Then it was my turn to try it out. The first thing I noticed when strap-ping the airplane on was that Poberezny and crew certainly gained their objective of adequate cockpit room. It's wide, it's long, and it's deep. With a little forethought when building, I'd be willing to bet that the airframe would accept somebody up to around 6'5" or more. There's plenty of leg room, and head room is naturally unlimited.

PANEL

You're not going to be shooting an approach to IFR mini-

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AkroSport — continued

(Continued from page 19)

mums so what else could you possibly want?

The Inman/Shatt Akrosport has a complete electrical sys-tem, something that probably contributes to the cg balanc-ing on the forward edge of the envelope. There are lots of times when it's handy to have a starter, but they sure do weigh a bunch. Anyway, I availed myself of the electri-cal system and lit the burner on the 180 hp Ly -coming first try.

Taxiing out I was super impressed with the rud-der/ tai wheel ratio. The steering was posi-tive, extremely posi-tive, but far from sensi-tive. The air-plane fol-lowed my feet with practically no tendency to overshoot when turn-ing. I meant to look at the tail wheel springs to see if they were pretty stiff or what. I also noticed that with a 2" cushion under the parachute, I had a fair amount of visibility, not a lot mind you, but enough that with plenty of "S" turning I felt comfortable. A Pitts in the same situation is a bit blinder, although neither airplane is going to qualify as a C172 in the vis department.

As I swung around on the runway to clear traffic I auto-matically started bringing the power up, as I came back to-wards the centerline. I was already moving at a pretty good clip when I eased the goknob the rest of the way in, but I was unprepared for the rate at which the runway markers started flashing past the wing tips.

The airplane is fairly heavy for its size, but you sure wouldn't know it by the way it leaps off the ground. I barely had time to get the tail up be-fore we were gone! Those lar-ger than Pitts wing panels really do work! Also, when I had it up on the main gear it felt so positive, so solid, that control was no problem. I was simply driving it with my feet. Actually. control isn't needed anyway because the airplane launches itself long before you can get in much trouble.

Keeping the needle stuck on 85 mph during climb out made me feel as if I was laying on my back. The nose alti-tude at that speed is high, I mean really high. I was leaving the ground behind at the rate of about 1500 fpm, so by the time I cranked into a ninety left and fortyfive right, I was at a solid 1200 feet agl and going up fast.

It was a clear, cool autumn day, and after six solid weeks of typical New Jersey grungy weather, we had earn-ed it. Climbing out away from Sus-sex, the Akrosport felt as if it was going to be by far the best pinnacle from which to survey such a day. The plane's com-paratively big flight deck, the excel-lent visibility, and the overall feeling of aerial wellbeing was doing its best to put my mind in another dimen-sion.

I looked down at my gloved hand wrap-ped around the fighter type grip on the stick and giggled a bit (I do that a lot). My mind's eye was watching the quickly yellowing af-ternoon sun turn the cockpit interior into a sepia toned print out of a late movie. The gloved hand that moved the stick and rotated the horizon belonged not to me, but to Richard Arlen, Wallace Beery, or any one of a dozen other of the late- movie aces.

I was getting off on the ex-perience of watching myself fly a fun machine on a fun af-ternoon. I wasn't experienc-ing, I was watching myself as if on the boob tube, the pe-rimeters of the picture being the frames of my own goggles. The plot line was not mine, but that of a thou-sand plot-less aviation flicks that con-stantly hover around the edges of my consciousness. What do I do, where do I go? Where will that virile looking gloved hand take me? To fight the enemy? To chart unknown wilderness? As a spectator I didn't care.

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AkroSport — continued

(Continued from page 20)

Any-where in the air was someplace else, and that is the function of a machine such as the Akrosport, to transport one's mind, if not body, to an-other place, another time.

But the time is now and the place is here, so when I pushed over into level flight, it was back to the business of evaluating. Daydreaming is fun but I wasn't there to dream and, as I felt the controls be-ginning to stiffen up with speed, I could see that the in-trusion of realities make for short- lived dreams.

The reality of the Ak-rosport controls is that they feel nice but are not what I'd like to sec in such a spirited looking, spirited mov-ing air-plane. I guess I could be called unfair for comparing the Ak-rosport's controls to those of a Pitts, but why not? That's what the Akrosport is sup-posed to be in the everyman's mar-ket, an "almost Pitts." But the controls aren't even close to "almost."

For one thing, the ailerons just don't do what they should for the airplane. While they aren't particularly heavy, they are way down the scale in ef-fectiveness, so roll rate and roll response suffer. They just aren't as clean and responsive as I personally think they should be.

The "super" wing with the 23012 report-edly has much crisper ailerons. How-ever, the ailerons can be lived with, but the elevators can't. The eleva-tor pressures are heavy, and any maneuver needing a lot of elevator is going to use up a lot of arm.

Later plans in-corporate a servo tab that does won-ders for the elevator pressures. (Ed Note: These points have probably been addressed since writing this paragraph, so check around before taking my word for it.)

It should be mentioned that this particular Akrosport and its severe case of the nose-heavies is supposedly not typi-cal of all Akrosports. How-ever. the EAA happily admits that, as designed, the Akro's cg will be some-where near the front of the envelope because it makes a safe, more stable handling airplane.

The Inman/Shat airplane compounds the problem by the inclusion of the electrical sys-tem, something the plans don't take into account. Also, the plans put the fuel tank almost entirely in front of the cg with a smoke oil tank located be-hind it. I'd like to see the fuel tank slid back to where it at least sits right on the cg. Even in stalls, the noschcavy bal-ance of the airplane changes its per-sonality all out of pro-portion.

The air-plane just about can't be stalled be-cause it runs out of elevator at about 68 mph and just mushes straight a-head with the ele-vator full back. Even by accel-erating the stall with "G", very little changes. I have no doubts that the little bugger has docile, straight-forward stall characteristics, but you couldn't prove it in that air-plane be-cause I couldn't get it to break under normal con-ditions.

AKROSPORT VERTICAL

It's not a Pitts, but it does fairly well when working the vertical.

The "Akro" part of Akro-sport is one of its strongest selling points, so I pulled and jabbed all I could to see if it lived up to its name. As it hap-pens, I had broken a rib a cou-ple of days earlier (Don't ask), so I was being just a bit con-

(Continued on page 22)

AkroSport — continued

servative; but I managed to put minus 3.5 and plus 4.5 on the G meter with all my she-nanigans, much less than I'd put on a Pitts in the same situation.

Quite honestly, the nose-heavy na-ture of Inman's air-plane did a lot to take the edge off some of its aero-batics. Some of the maneu-vers, like snap rolls, were just plain work. Also, with the climb prop that's stuck on the Ly-coming, every time I pointed the nose down to get some speed 1'd glance over and see the tachometer streaking past the 2900 rpm redline.

Anyway, as I ar-rived at altitude and packed some numbers into the air-speed indica-tor, I pulled up into a slow roll and found myself using a lot more forward stick than I'm used to. I love slow rolls almost as much as sex and ice cream (I said almost) and I was just a tad disappointed to see how hard I had to work to make it do its number. Oh no, its nothing nearly as bad as a Citabria or De-cathalon. but the Akrosport is sure as hell no Pitts. Fortunately, it's got plenty of rudder so you can hang in there for a long time when doing point rolls. I never did get a good vertical roll out of it because I just couldn't get the speed and keep the prop under red-line.

At 170-180 mph I'd have to wait until I was almost estab-lished on the vertical up line before I could hit the throttle and not over speed the engine. Also, a combination of too much weight and drag com-bined with its slow roll rate to make it damned diffi-cult to get all the way around.

Inverted, I found that even with full nosedown trim I still had a size-able amount of for-ward stick in it to keep the nose up, which is nothing un-usual. I, couldn't fault its in-verted performance, and I'm certain that it'd be a dream with the cg in the right place and the 23012 wing. As it was, I was doing 45degree banked inverted turns and more or less holding my at-titude. Again, it's no Pitts but it is still pretty damned good.

The first time I pushed it outside. I did so from the bot-tom in a pushup. That's when the elevator pressures and my damaged rib cage got into a minor argument. I ended up using two hands when doing outside loops to keep from leaping out of the cockpit from the pain. From 150 mph, it cruised right over the top of an outside loop as long as I remembered to ease off the G". With negative G's on it, it gives a very distinct buffet when its about to make a fool of you by stalling, and all you have to do is relax the stick a bit to make it fly its way over. Go-ing outside from the top had me won-dering for a while if it was going to make it be-cause the eleva-tors just don't seem to be able to push it under easily. It'll go un-der just fine, but you're using some arm to make it go.

When spinning the airplane. I was prepared to have to fight to get it into a spin because of the cg problem. That wasn't the case . . . boy, was that ever not the case! As I brought the stick back and stomped the rudder, the wing whipped over the top as the nose tuck-ed down and I found myself with a face full of wildly rotating New Jersey.

It spins very nose down and as fast as any airplane I've ever spun (BD5 and T37 ex-cepted). However, when I got on opposite rudder and began to release backpressure, it jerked to a halt almost before I was ready. I found I could

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AkroSport — continued

(Continued from page 22)

do three to five turn spins and stop them much more precisely than I do in my own airplane.

As a normal rule, when I'm frolick-ing with an airplane like the Akrosport, I stay up until my hands turn green or I'm out of fuel. This time, however, after about 45 minutes, the two ends of my broken rib started talking to each other in a very un-civilized manner and I decided to call it a day. On the way back to the airport, I timed some rates of descent, power off, and found it to be about 1200 fpm at 90 mph and in a reason-ably flat attitude. Considering the size and configuration of the airplane, that's hardly even a number worth worry-ing about. A lot of Wichita Sheet Iron settles faster than that.

I held a solid 85 mph on final and was interested to see that the visibil-ity was only slightly better than a single hole Pitts, but quit a bit better than the two hole Pitts. Its nose attitude is low enough that you have most (most, not all) of a 3,000foot runway in sight during the approach. I was carrying about 1300 rpm and killed it when I cleared the Bell Tele -phone gear grabbers at the end of the runway.

I flared in a normal manner and suddenly found the runway leap-ing up into my peripheral vision, tell-ing me I had better finish rounding out or I'd ricochet off the runway by touching main gear first. I tugged the nose up to a three point attitude and found asphalt touching the tires at about the same time. The touchdown was smooth enough, but I still got a little hop, which I'm told is part of the Akrosport landing game. Pitts have the same little hop built into their landing characteristics.

As I whistled down the runway (there wasn't a breath of wind to help slow my touchdown speed), I was pleased to find I wasn't doing the "biplane boogie," as I usually do in a ship this size. It wasn't rolling dead straight, but it wasn't scaring the hell out of me either.

> *In general, I'd have to say that Poberezny and the EAA have achieved their goal...*

Because of the good steering, any time I needed to nudge things back into line, I just gently lean-ed on a rudder and that's where the airplane went. Many tail draggers have the rudder/tail wheel ratios set up such that any rudder at all sends you ca-reening towards the bushes. We do a lot of things right in homebuilding; we've got better feeling control than does Wichita, more responsive air-planes, and generally stronger, better performing machines, but we often fall down in setting up tail wheel steering. The Akrosport, however, seems to be headed in the right direction (pun in-tended).

I shot three or four landings in the Akrosport before I put it back in the barn, and one other characteristic confirmed itself: When flaring, it seems to settle through ground effect much faster than a Pitts, either a single -hole or two hole model. It feels a little like the old flat wing Pitts, only more so. However, carrying just a few hundred extra rpm into the flare and then bleeding it off lets you come down in a more leisurely manner.

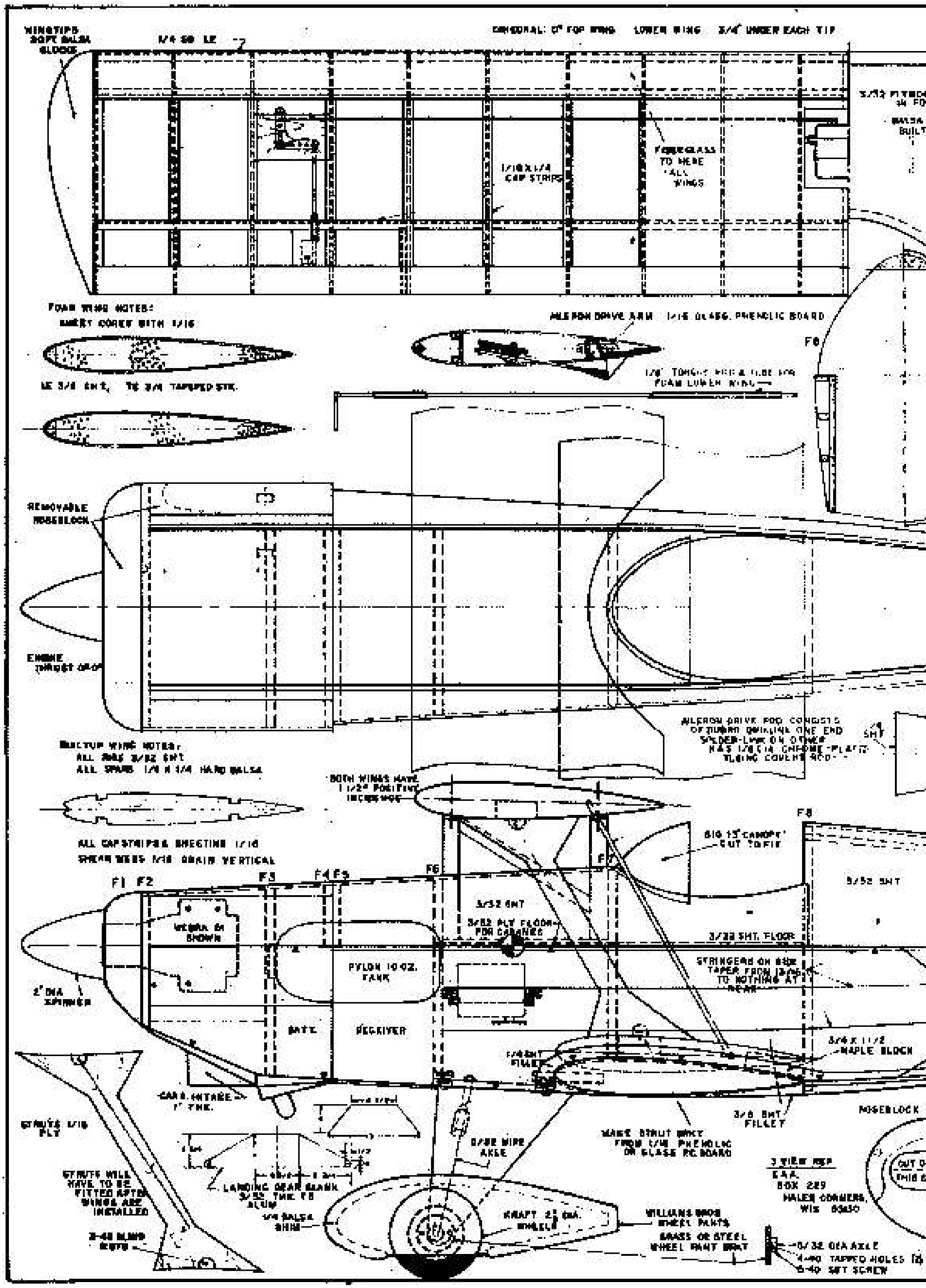
In general, I'd have to say that Poberezny et al have achieved their goal. While I had plenty of gripes about the airplane, I'm absolutely positive most of them were because of the cg prob-lem on this particular airplane. Reportedly, this is not the case with all others. Its acrobatic capabilities are really quite good, even though you have to work to make it do its best work.

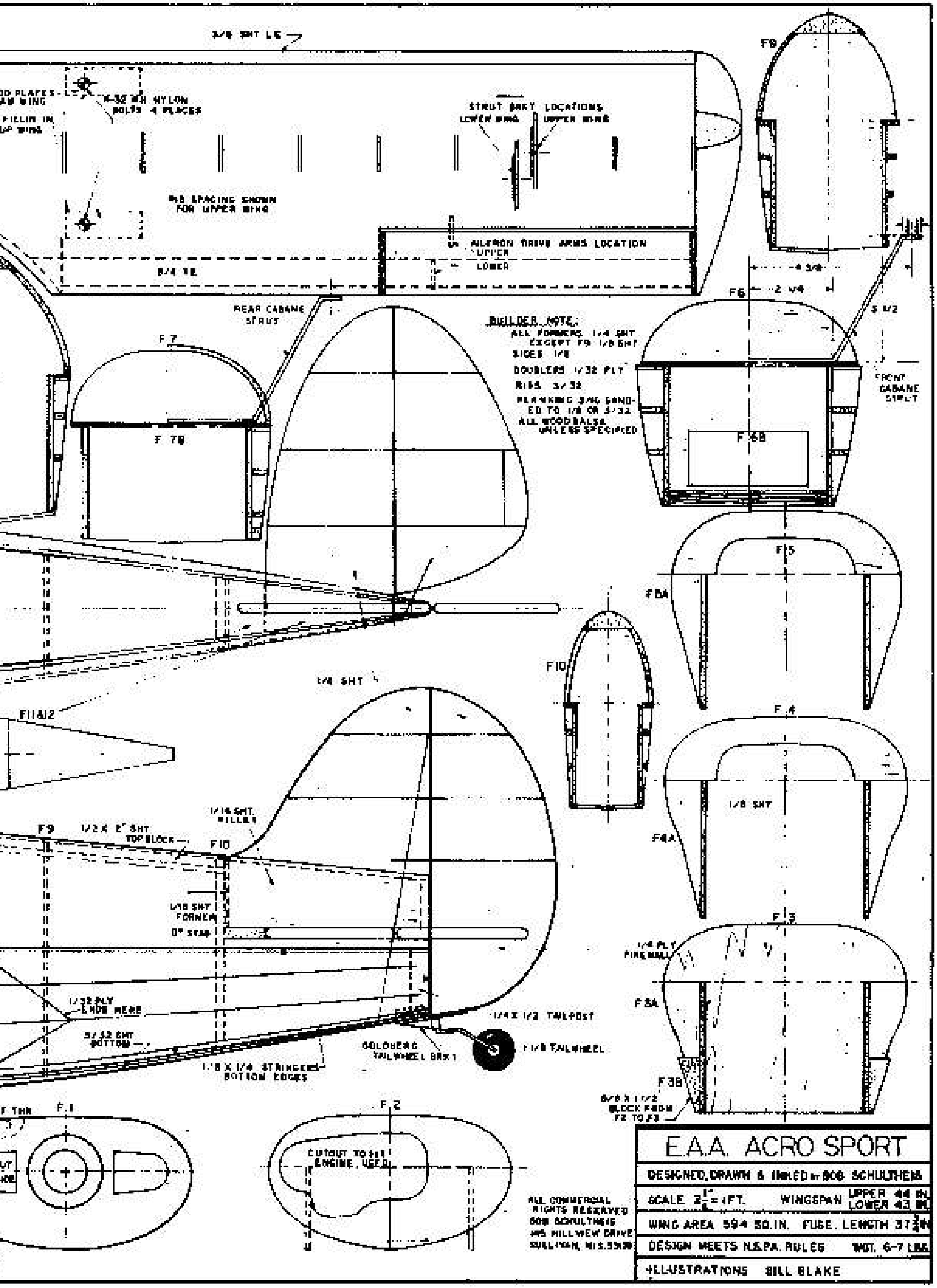
Inman's airplane had the M6 airfoil, so the semi-symmetrical one should be even better. It's really hard to compare its aerobatics with any other airplane without flying them in the box in front of judges, but I'd guess it about matches a two hole Pitts in most areas except vertical maneuvers.

What the Akrosport represents is exactly what the EAA wanted: It is an acrobatic airplane with almost Pitts performance and better than Pitts manners.

One of my friends persists in calling it a "Pitts for grandfathers," and I think he's right, which ain't all bad.

AkroSport — continued

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FORMER
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1/4 PLY
FIREWALL
GOLDBERG
TAILWHEEL BRKT
1 1/8 TAILWHEEL
1/8 X 1/4 STRINGERS
BOTTOM EDGES
3/32 SHT
BOTTOM
F 1
F 2
CUTOUT TO SUIT
ENGINE USED
ALL COMMERCIAL
RIGHTS RESERVED
BOB SCHULTHEIS
E.A.A. ACRO SPORT
DESIGNED, DRAWN & INKED BY BOB SCHULTHEIS
SCALE $2\frac{1}{2}$" = 1 FT.
WINGSPAN UPPER 44 IN. LOWER 43 IN.
WING AREA 594 SQ.IN.
FUSE. LENGTH $37\frac{3}{4}$ IN.
DESIGN MEETS N.S.P.A. RULES
WGT. 6-7 LBS.
ILLUSTRATIONS BILL BLAKE

Magneto Ignition Systems

by Will Fox

The technology for the modern airplane magneto ignition system is over 100 years old and yet still remains the principal ignition system used for general aviation aircraft. Why is this?

It is really a marvelous little invention. It generates its own electrical energy completely independently from any other electrical source, provides thousands of perfectly timed sparks each minute to ignite the air/fuel mixture in the engine and is able to not only retard its timing to properly start the engine but also produces a hot energetic spark with virtually no crank speed so that the engine can be started by hand.

Another reason is reliability. The failure rate of aircraft engine magneto ignition systems is once in every 5000 hours, but the failure rate that results in an engine shutdown is only once every 100,000 hours. This mean that while the average pilot may experience an ignition system failure during his flying career, the probability of an ignition failure leading to an engine failure is very remote.

The purpose of the magneto is fairly simple. It must generate an electrical spark of sufficient intensity to ignite the air/fuel mixture at the correct time during the cycle for maximum engine performance.

So to start with, what sort of electrical spark is required to do this? Well, it looks like a big, fat blue spark that is readily visible even in daylight conditions. This spark packs a pretty good punch. The voltage is about 10kV initially and then drops to 1kV after the arc is established for normal firing.

Bendix S-1200 Magneto

The coil in the magneto can produce up to a 20kV spark if necessary for very rich or lean conditions or for high pressure mixtures produced by high compression ratios or turbocharging. The normal aircraft sparkplug gap is 0.016" to 0.021".

THE MODERN AIRPLANE MAGNETO IGNITION SYSTEM IS OVER 100 YEARS OLD...

The greater the spark gap, the greater the voltage required to jump the gap. The greater the gap, the better the ignition of the air/fuel mixture, but the higher the stress on the high voltage components in the ignition system.

Most experts recommend gapping your plugs often and on the smaller end of the range to reduce stress on the magneto and wear of the sparkplug.

Lets take a look at how the aircraft magneto works. A magnet attached to the rotor of the magneto is driven by the engine and rotates such that alternating lines of magnet flux pass through an electric coil known as the primary winding.

These alternating lines of magnetic force produce a wave like flow of electrical current in the primary winding. The faster the magnetic field moves through the coil, the higher the crest of the wave. The voltage produced in the primary winding can exceed 200 volts.

While this can give you a pretty good jolt, it is not nearly enough voltage to produce a spark large enough to fire a high pressure air/fuel mixture. So a second coil with a 100 times the number of windings as the primary coil is inductively coupled to the pri-

Magneto Ignition — continued

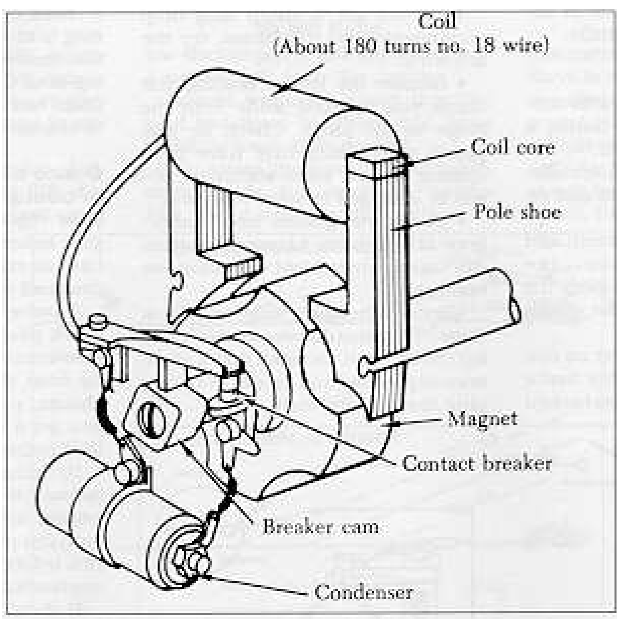
Slick 6300 Magneto

mary coil.

The secondary coil is capable of much higher voltages than the primary coil, in fact a 100 fold higher, or over 20,000 volts in some magnetos. In order to produce this kind of voltage, the energy in the primary coil must be transferred to the secondary coil at just the right time. The transfer is accomplished by interrupting the circuit in the primary coil just as the wave of electrical current reaches its peak.

This interruption of electrical current in the primary coil forces the energy into the secondary coil via the inductive coupling. The interruption of current is accomplished by opening a set of breaker points that are driven by a cam on the rotor. You might ask why doesn't an arc form across the breaker points as they begin to open rather than across the spark plug gap?

Well, it would, were it not for a capacitor connected to the points in parallel that absorbs the energy from the coil just long enough to allow the points gap to reach a spacing that is too great for the primary coil to spark across.



You can see that without this capacitor, the magneto would not work properly because the sparking would be taking place at the points rather than the sparkplug. To maximize the voltage potential in the secondary coil, the rapidly changing magnetic flux in the primary coil needs to be interrupted at the point in time when the flux is changing most rapidly, so the points need to open at just the right position during the rotation of the rotor.

Slick coil x-section showing the primary coil (thicker wire) and secondary coil (thinner wire) wrapped around the laminated iron core.

There are two internal adjustments that must be set correctly for a magneto to operate properly: point gap and "E-gap". The point gap should be set first. To do this, the drive shaft of the magneto is rotated to the position at which the cam has opened the breaker points to the maximum extent.

Then the point gap is measured with an ordinary wire-type feeler gauge. The points are then adjusted for the specified gap (normally about .018 inch for Bendix mags). Once the point gap is correct, the "E-gap" can be set. First, rotate the rotor slowly until you can feel a "magnetic detent." This is known as the "neutral position" of the rotor. Now, with a timing light ("buzz box") attached across the breaker points, rotate the magneto until the points just start to open.

The number of degrees of rotation from neutral to point opening is called the "E-gap" (Electrical gap or

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Magneto Ignition — continued

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Efficiency gap) and needs to be set to a specified value (e.g., 10 degrees +/- 2) so that the points open exactly when magnetic field induced in the coil by the rotor is at its maximum.

On the big Bendix S-1200 and dual Bendix D-2000/3000 mags, this adjustment is made by loosening the screw that attaches the cam to the rotor shaft, and rotating the cam

until the "E-gap" is correct. Other magneto models have non-adjustable cams, so the "E-gap" adjustment is made by adjusting the breaker points.

The correct adjustment of the E-gap is crucial to producing an energetic spark. If the E-gap is not set properly a poor spark or no spark at all may result. Also as the points erode and the actuator arm wears the gap changes and needs to be readjusted to produce the best possible spark. Slick magneto showing the timing pin inserted.

Now that the E-gap is properly set, we need to set the engine timing properly for best operation. Normal engine timing is set to ignite the air/fuel mixture 20-25 degrees before top dead center (BTDC) as specified by the engine manufacturer. The air/fuel mixture is ignited while the piston is still on the compression stroke. This is because, at high (2700) rpm it takes a while for the mixture to fully ignite and as a result, maximum pressure on the piston does not occur until the piston passes top dead center on the compression stroke and begins the expansion stroke.

The magneto needs to be timed such that the spark plug fires early enough to accomplish this. The magneto rotor is positioned using timing marks typically located on the gears in the magneto, so that the points are just beginning to open. Most magnetos allow a pin to be inserted through the housing and gears to lock the rotor in the proper position.

The engine is then set to the proper position of 20-25 degrees BTDC by timing marks located on the engine. The magneto is then inserted into the accessory case on the engine and this engages the drive gear on the rotor. At this point, the timing is pretty close to being perfect. It may be slightly off though due to play in the gears. This can be checked by using a timing light or timing buzzer, and a fine adjustment can be made by removing the locking pin in the magneto and rotating the magneto housing very slightly in one direction or the other to get the timing right on.

Over time the points and cam follower wear resulting in a change in the E-gap as well as in the timing of the engine. "Bumping the mag" is a term used to describe setting the timing by rotating the magneto in the accessory case to compensate for wear of the magneto.

While this can correct timing errors, it changes the E-gap and reduces the energy in the spark. Slick allows up to a 5 degree correction in timing by

"Bumping the mag' but recommends resetting the E-gap if more correction than this is required.

Starting an engine with the timing advanced 25 degrees can be very exciting. It usually results in a backfire and is not only hard on the engine but can actually break engine components like starters.

To properly start, the normal engine timing needs to be retarded by 25-35 degrees. The magneto uses what is known as an impulse coupling to accomplish this task. When the starter cranks the engine, a spring-loaded flyweight in the magneto drive hub catches on a stationary stop pin mounted

on the magneto case. This stops the magneto shaft from turning further. As the engine continues to turn, an impulse spring in the hub is wound up for 25° to 35° of engine rotation (the "lag angle") until a drive lug on the coupling body trips the flyweight, disengaging it from the stop pin. At this point, the wound-up impulse spring "snaps" the magneto through its firing position at a speed much faster than cranking speed. This results in retarded spark timing for good starting.

The spring driven, high rotational speed of the magneto produces a very good energetic spark. This is why very little propeller rotation speed is needed to start even very large engines. It is also why an ungrounded magneto can be very dangerous, because any propeller movement that trips the impulse coupling can produce a powerful enough spark to start the engine.

Let me make a couple of other comments on the design of the magneto. The lag angle is different for different engines and different magnetos. For Slick magnetos on Lycoming engines it is 5-20 degrees and with Slick magnetos on Continental engines it is 25-35 degrees. Lag angles on Bendix magnetos range from 10-45 degrees.

Why the variation in lag angles? The amount the timing is retarded depends not only on the lag angle but also on the starter speed. It takes a finite time for the points to break after the impulse coupling is tripped. During this time the engine is being turned over by the starter.

The faster the starter turns, the more the engine rotates before the magneto can produce a spark. So different engines with different magnetos with different starters need different lag angles.

Think about this next time you put one of those high speed starters on your engine or find a "good" replacement mag for your engine at an fly-in swap mart. If the engine doesn't start or it backfires during starting, you may have the wrong lag angle on the impulse coupling.

The impulse coupling incorporates a pair of flyweights to decouple the retard feature after the engine starts. The flyweights rotate around a pivot that is can wear over time. In some impulse coupling designs, severe wear between the flyweight and the pivot pin can result in catastrophic failure of the engine. The wear is initially apparent as scuff marks on the flyweight arm as the wear allows the heal of the flyweight to graze the stop pin.

Periodic inspection of the flyweights will detect this wear before it becomes a problem. If it is not detected and the wear continues, it can become so severe that the contact with the stop pin can cause the flyweight to fly outward and engage the next stop pin. If this occurs at cruise rpm, the impulse coupling will disintegrate in the accessory housing resulting in an engine stoppage. If you ever wondered about the periodic inspection requirement on some impulse coupling, now you know why. Sheared flyweight pivot pin. The permanent magnet attached to the rotor is not permanent. It loses strength over time due to vibration and heat, and needs to be periodically remagnetized to produce an energetic spark. This should be done when the magneto is overhauled.

The magneto incorporates high voltage rotary switch to direct the spark to the correct cylinder. This switch is driven by the rotor and is called the distributor. It needs to be kept clean. Contaminants such as oil and water can lead to electrical breakdown and carbon tracking of the distributor. This re-

(Continued on page 30)

Magneto Ignition — continued

Web Sites

http://selair.selkirk.bc.ca/systems1/Engines/Aircraft%20Magneto%20systems.html
http://www.avweb.com/news/maint/182843-1.html
http://www.aircraftmagnetoservice.net/
http://flighttraining.aopa.org/magazine/2002/January/200201_Features_The_Magneto_Check.html

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sults in misfiring of the engine and typically occurs at higher altitudes where lower air pressure results in less electrical insulation.

The capacitor connected in parallel with the points is a very important part of the magneto operation. It prevents the points from arcing which makes for a hotter spark as well a reducing points wear. If the capacitor shorts to ground, it is the same as turning the ignition off, the magneto just doesn't produce a spark across the secondary.

If the capacitor fails open, the points will arc until they separate far enough to extinguish the 200-300 volt arc produced by the primary coil. This arc will absorb quite a bit of energy resulting in a much reduced spark at the spark plug. It also retards the timing, resulting in a loss of engine power at higher rpms.

Badly neglected Bendix coil The reliability of the magneto is quite high. It would be even higher if it were properly maintained. The general maintenance approach on mags seems to be that "if it ain't broke don't fix it" and "you've got two of them in case one fails, so don't worry about it".

Those with this approach to magneto maintenance should remember Murphy's Law, "When it breaks it won't be on the ground". The problem with this approach to magneto maintenance is that you are giving up engine performance along with reliability.

REMEMBER MURPHY'S LAW, "WHEN IT BREAKS IT WON'T BE ON THE GROUND"

The timing drifts with magneto wear and this results in poorer performance as well as poorer gas mileage. You are also likely to see more failures in expensive components such as coils, distributors and high voltage leads then would not normally occur if normal maintenance was performed. It is therefore recommended that the timing and sparkplugs be checked and adjusted every 100 hours. The magneto should be removed from the aircraft and disassembled, inspected, and maintained every 500 hours.

Well, that is it for magnetos. In the next installment we will talk about retard breaker points (Shower of Sparks) and some of the new CDI systems and their pros and cons. In the mean time, keep those plugs sparking.
good

Troubleshooting Magnetos

The following troubleshooting guide is designed to help you, the mechanic or pilot, determine if the source of your ignition system's "bad mag check" lies with your engine's magnetos. This guide is, of necessity, incapable of addressing every conceivable ignition or engine fault. However, it is a good foundation in initial basic troubleshooting and will enable you to find the source of the "bad mag check" most of the time.

Consult your pilots operating handbook for acceptable mag drop values.

Most "bad mag checks" are spark plug related. The spark plug is fouled and shorted to ground or is open and the magneto, which is functioning normally, is unable to fire it. A typical bad plug will cause an immediate drop of 250 or more RPM, at the mag check. The key indicator is the suddenness of the drop.

You have tried leaning and cleaning the plug to no avail. How do you find it? No fancy equipment is needed to isolate the cylinder and its defective plug, if you follow this method:

- Shutdown the engine and remove the cowling as required.
- Allow the engine to cool completely.
- When the cylinders are at ambient temperature, or just slightly warm, restart and immediately turn to the "bad mag." Adjust the RPM to allow the engine to run at its roughest.
- Run the engine for approximately 1 to 2 minutes, reduce RPM to idle and shutdown with mixture to idle cutoff. Mags off.
- With the palm of your hand placed on the cylinder head fins, go from cylinder to cylinder comparing the temperatures.
- The cylinder with the bad plug will be colder, if not dramatically colder.
- Trace the ignition harness from the "bad mag" to the cold cylinder spark plug and you will find the non-firing or misfiring spark plug.
- The spark plug could be lead fouled, fuel fouled, oil fouled, or effectively opened through its resistor.
- Pick out lead deposit clinkers, inspect the barrel for cracked insulator, inspect the nose core for cracks.
- Clean and inspect the plug (correct gap for most plugs is .015" to .019" consult your plug specifications).
- Take an OHM Meter and measure the resistance value from the connection in the bottom of the barrel to the clean center electrode at the firing end, electrode must be bare metal.
- A new Champion plug will have a value of 800 to 1200 OHMS. New Tempest (formerly Unison-Autolite) will measure 1000 OHMS. Replace any plug above 5000 OHMS.
- A spark plug bomb tester can test a bad plug and lead you to conclude it is serviceable. The OHM Meter check is simple, readily available, and amazingly accurate in finding misfiring plugs.
- Reinstall the cleaned, tested, and inspected plug. Re-run the engine.

If you get the same cold cylinder test, the spark plug lead is possibly shorted to ground. You will need a high tension lead tester to find the fault:

- Remove the harness cap and test the lead for high voltage breakdown and continuity. (resistance values increase with lead length.)
- Inspect the insulator boots at both ends of the lead. Leaks resemble a dark pin point on the insulator.
- Inspect the magneto dis-

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Troubleshooting Magnetos — continued

(Continued from page 31)

tributor block tower that goes to your cold cylinder. You are looking for evidence of carbon tracking and a resultant short to ground.

If you cannot discern any major difference in cylinder to cylinder temperature you have a bad magneto. It is firing all the plugs intermittently and all the cylinders have been functioning.

- Remove the P-Lead from the "bad mag" and run the engine again to eliminate the mag switch, p-lead wire, and filter capacitor if one is installed.

Caution: The mag is hot when the p-lead is removed.

A magneto drop that exceeds the allowable limit, but is smooth, with no roughness is in most cases, late engine timing. Cam follower wear makes point opening late.

- Check magneto to engine timing.

The magneto designers have gone to great lengths to have the cam follower, or cam in the case of Slick, wear at the same rate as the point faces. This design feature keeps the magnetos internal timing, "e-gap", at the correct angular opening point for long periods of time.

- Inadequate lubrication of cam and cam follower will accelerate wear and result in late engine timing.
- A late spark reduces the sustainable RPM at the mag check. All the fuel is not burned and returned as energy to the piston, but is burned in the exhaust system. Higher than normal EGT will result with late ignition timing.
- On impulse coupled magnetos a broken impulse coupling spring will severely retard engine timing and result in a very large, slowly occurring RPM drop. In some cases the engine will slow down sufficiently to quit. With single impulse coupled installations hard starting will occur.

Keep the spark plug ceramic barrel and harness insulator clean. No finger prints. Inspect the ignition harness cigarette springs where they contact the spark plug in the barrel. Look for evidence of arcing. The spring will erode and become razor sharp. This is a bad connection. Change the spring. High resistance connections dissipate energy and can cause hard starting and underperforming ignition.

DIY RIVET SQUEEZER

One of the every day tools the aircraft builder is going to add to the toolbox is a hand squeezer. Commercial models are $100 or more. But, we show how to have a high quality alternative for a fraction of the price.

An inexpensive rivet squeezer can be made from a Harbor Freight $10 pair of bolt cutters by grind the blades as shown in the picture.

First Pilot License

By Jan Zumwalt
EAA #66327

If you thought the Wright brothers received the first federally approved pilot's licenses, you'd be wrong.

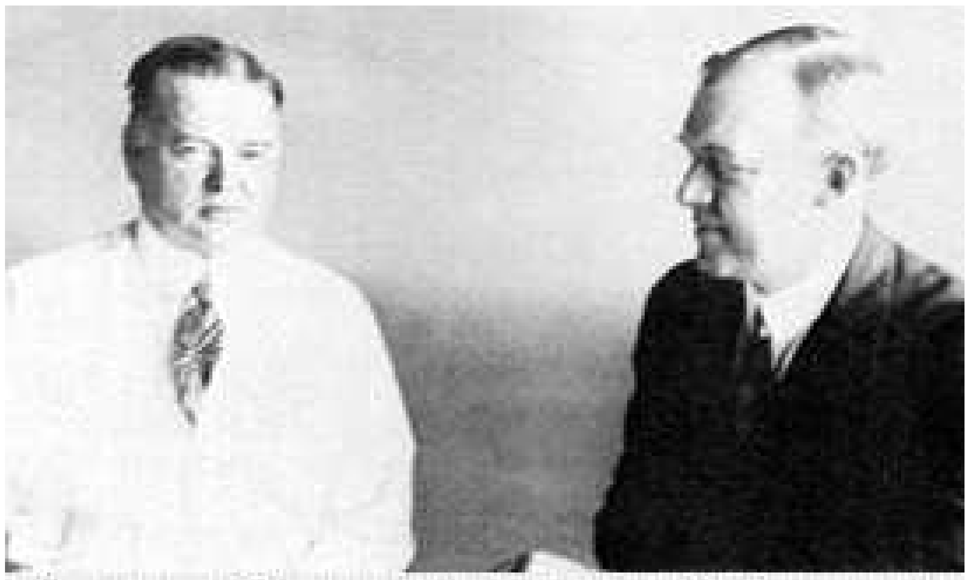
Contrary to popular belief, the first person to receive a civilian federally approved pilot's license in the United States was not a Wright brother. It was William P. MacCracken, Jr.,Assistant Secretary of Commerce for Aeronautics.

The date: April 6, 1927. Prior to that date, the Aero Club of America, (a pred-ecessor to the National Aeronautic Association) issued licenses. Some states also issued licenses, and the United States military issued licenses to civilian pilots in a program that began during World War I and continued through 1919.

The Wrights also lost out on getting the first type certificate. The first aircraft to receive a type certificate was a BuhI Airster C-A3, which was a three-place open cockpit biplane. The certificate was issued March 29, 1927 by the Aeronautics Branch of the Department of Commerce.

William Petterson MacCracken, Jr. (September 17, 1888 - September 1969) was a pioneer aviator. MacCracken became the first federal regulator of commercial aviation when then-Secretary of Commerce Herbert Hoover named him the first Assistant Secretary of Commerce for Aeronautics in 1926. During World War I he had served as a flight instructor, had served on the Chicago Aeronautical Commission, and was a member of the board of governors of the National Aeronautical Association when selected by Hoover.

After helping to draft key safety standards and regulation that became part of the 1930 Air Mail Act, MacCracken returned to his private law practice, where he continued to be involved in the growth of commercial aviation by representing many major airlines.



Secretary of Commerce Herbert Hoover (left) appointed William P. MacCracken to the new position of Assistant Secretary of Commerce for Aeronautics in August1926.

Charles Lindbergh (l) and Bill MacCracken (r) worked together to promote aviation in the years after Lindbergh's flight to Paris in 1927. MacCracken's federal Aeronautics Branch played a big part in Lindbergh's 48 state tour with the Spirit of St. Louis during the summer of 1927. The men became lifelong friends.

Before Lindbergh's Paris flight, MacCracken was considering grounding Lindbergh for bailing out of two Robertson DH-4 mail planes in the fall of 1926.

Murphy Aircraft Company 4Sale

Located in Chilliwack, British Columbia, Canada, Murphy is for sale. Asking price: $2.5-$4 million. Founded in 1985, the company builds a line of experimental airplane kits targeted at homebuilders desiring utilitarian, back-country craft that can operate on wheels, skis or floats. The line includes the biplane Renegade Sport, and monoplanes Rebel Sport, Rebel, Maverick, Elite and Moose. The package offered for sale includes all eight aircraft models and three sizes of straight and amphibious floats, the existing inventory and quick-build jigs for the Renegade and Moose. Murphy Aircraft's announcement says the sale price will be in the $2.5 to $4 million range, depending on how much of the manufacturing machinery the buyer desires. A tailored training program can be provided.

Spaceship 2 Hits Mach 1.4

SpaceShipTwo went higher and faster than it has been before on Friday and Virgin Group President Sir Richard Branson is predicting it will reach space sometime in 2014. Branson had hoped the reusable passenger-carrying rocket would have slipped out of the atmosphere by the end of 2013 but Friday's flight showed progress toward the ultimate goal. The spacecraft hit Mach 1.4 and 71,000 feet (from a starting altitude of 46,000) in flight, which was captured from multiple angles by video cameras on the mothership Eve and the spacecraft itself.

Jabiru Crashes On Takeoff

A New Zealand pilot and his passenger are nursing bruised egos after two strokes of bad luck became fodder for news programs all over the world. Peter Horn and his passenger were on a sightseeing flight in Horn's Jabiru light single over Martin's Bay, just north of Auckland, when the engine quit. Horn managed to get the little plane safely onto the beach and promptly found a fuel system blockage. With the repairs made in front of dozens of beachgoers, he fired up the Jabiru and, well, almost had the perfect ending to a lousy day.

As the aircraft accelerates, it starts to slip down the beach's slope toward the surf line. Just as the nose is coming up, the left wheel digs into the water and soft sand and the little plane all but disappears in a shower of seawater.

Salt water and sand does not help improve long term maintenance and dependability for any aircraft!

Teen Takes Control, Saves Pilot

An Australian teen who had a little supervised stick time was able to maintain control of a Cherokee 180 after the pilot lost consciousness on Saturday. About 45 minutes later the pilot, 61-year-old Derek Neville, came to and 19-year-old Troy Jenkins helped to land the aircraft safely back at Forbes Airport in New South Wales. "He (Neville) sort of poked me in the right direction and we both brought it down," Jenkins toldThe Associated Press a day after the incident. Jenkins and Neville were only about 10 minutes into the flight when Neville inexplicably passed out. Jenkins said Neville, a family friend, had let him take the controls before and he was comfortable keeping the Cessna straight and level. He had also landed once under Neville's supervision.

Pilot Association Pays $53 Million

The Air Line Pilots Association will pay $53 million to settle a lawsuit in which former TWA pilots alleged the union failed to properly defend their seniority rights. The pilots were working for TWA when it was bought out of bankruptcy by American Airlines. Many of the TWA pilots were put on the bottom of the American seniority list and in the air travel slump after the 9/11 attacks they were the first to be laid off. ALPA represented the TWA pilots but the Allied Pilots Union represented American pilots.

Some of the affected TWA pilots launched a suit in 2002 and a jury ruled in their favor in 2011. The trial to determine damages to be paid by ALPA was to begin in March but the union offered to settle instead. ALPA told its members that much of the settlement, will be covered by insurance and the remainder won't affect day-to-day operations of the union.

$1 Million Plane & Truck

An anonymous bidder paid $750,000 for a nostalgic package that included a Cessna L-19 Bird Dog aircraft and a Dodge M37 army truck at a Barrett-Jackson auction last weekend.

Another $250,000 in donations was also raised for the for the Armed Forces Foundation's educational effort on the effects of post traumatic stress disorder (PTSD). Cessna donated the aircraft, which is one of about 130 flyable Bird Dogs. Okoboji Classic Cars, of Spencer, Iowa, donated the truck.

A quick survey of used aircraft sites puts the value of a good Bird Dog at about $80,000 while drivable examples of the truck go for less than $10,000. The aircraft and truck in the auction had undergone full restorations.

EAA Chapter 837
MEETINGS

Meetings are held the 3rd Wednesday of each month at 7:30pm. The meeting place is located at the Payette Airport Community Center

Community Center — Ph. 208-642-4949.
Visitors are always welcome.

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Contact Us

Chapter: EAA 837
President: Jan Zumwalt
Phone: 208-968-0264
Location: Payette, ID USA
Email: president@eaachapter837.org
Visit: www.eaachapter837.org

Editor: Jan Zumwalt
editor@eaachapter837.org
208-968-0264